JAN 6 1934

BROWN UNIVERSITY LIBRARY
JAN 5 1934

Mat

Club Rates may be had on Application

Mathematics News Letter

SUBSCRIPTION $1.00 PER YEAR Single Copies. . 15c

Published eight times per year at Baton Rouge, Louisiana.

Dedicated to mathematics in general and to the following aims in particular: (1) a study of the common problems of secondary and collegiate mathematics teaching, (2) a true valuation of the disciplines of mathematics, (3) the publication of high class expository papers on mathematics, (4) the development of greater public interest in mathematics by the publication of authoritative papers treating its cultural, humanistic and historical phases.

EDITORIAL BOARD

S. T. SANDERS, Editor and Manager, L. S. U., Baton Rouge, La.
T. A. BICKERSTAFF, University, Miss.
W. VANN PARKER, Miss. Woman's College, Hattiesburg, Miss.
W. E. BYRNE, Virginia Military Institute, Lexington, Va.
RAYMOND GARVER, University of California at Los Angeles, Los Angeles, Cal.
P. K. SMITH, L. P. I., Ruston, La.
JOSEPH SEIDLIN, Alfred University, Alfred, N. Y.
C. D. SMITH, Miss. State College, State College, Miss.
DORA M. FORNO, N. O. Normal School, New Orleans, La.
IRBY C. NICHOLS, L. S. U., Baton Rouge, La.
H. LYLE SMITH, L. S. U., Baton Rouge, La.
W. PAUL WEBBER, L. S. U., Baton Rouge, La.
WILSON L. MISER, Vanderbilt University, Nashville, Tenn.
MRS. MARTIN L. RILEY Baton Rouge, La.
JAMES McGIFFERT, Rensselaer Polytechnic Institute, Troy, N. Y.
HERBERT ReBARKER, East Carolina Teachers College, Greenville, N. C.
LILBURNE NICHOLSON DASPIT, L. S. U., Baton Rouge, La.
DOROTHY McCOY, Belhaven College, Jackson, Miss.

MRS. E. J. LAND, Advertising and Circulation Manager . . . 216 Main Street, Baton Rouge, La.

VOL. 8 BATON ROUGE, LA., DECEMBER, 1933 No. 3

CONTENTS

T
Assoc
less b
not o
tions

L
ematic
fluenc
within
challe

A
rather
of Su
whom
descen
a day.
lengec
that ti
that cu
al traj
of its

N
mathe
intima
said c
alway
solutic

In
would
tions,
pronou
solved

Historic Contests in Mathematics

The recent creation of a Southern Intercollegiate Mathematical Association for the promotion of annual contests in mathematics doubtless brings to many minds memories of problem-solving challenges that not only made history but in some instances even determined directions of mathematical activity.

Descartes (1596-1650), "first of the modern school of mathematics," founder of analytical geometry, is said to have been influenced to the serious study of mathematics by his success in solving within a few hours a problem in geometry that had been issued as a challenge to the whole world.

At a time when most mathematicians were accustomed to conceal rather than to publish their discoveries, John Bernoulli (1667-1748) of Switzerland and Leibnitz (1646-1716) of Germany, the latter of whom took six months to solve the problem of the curve of quickest descent, proposed this problem to Sir Isaac Newton, who solved it in a day. Again, in 1716, when Newton was 74 years old, Leibnitz challenged the English mathematicians to solve a problem which up to that time, had not been solved. The problem was to determine the curve that cuts at right angles a given system of curves, that is, the orthogonal trajectory of the system. Newton laid out thoroughly the principles of its solution within five hours after receiving the challenge.

Newton's problem-solving ability was as great as his power of mathematical generalization. Very probably these two abilities were intimately linked together. The famous French astronomer Arago said of him, "The efforts of the great philosopher (Newton) were always superhuman; the questions he did not solve were incapable of solution in his time."

In 1764 the French Academy proposed a prize to any one who would answer the question, Why does the moon, with but slight variations, always turn the same phase to the earth? Joseph Lagrange, pronounced by Cajori one of the greatest mathematicians of all time, solved the question, winning the prize.

In the sixteenth century, Vieta, one of the early great in the field of algebra, was called by Henry IV of France to meet the challenge of a Belgian mathematician. The Belgian ambassador had told the king that France had no mathematician who was able to solve a certain equation of the 45th degree-one proposed as a world-wide challenge by Adrianus Romanus (1561-1625). Vieta, making use of a certain trigonometric equation, readily solved the question, after which he countered with a proposal to Romanus that he construct a circle to touch three given circles. Romanus could effect the construction only by using conic sections. When he had done so Vieta then showed him a construction by ruler and compasses only.

It was Tartaglia's (1500-1557) challenge to Floridas to furnish a solution which he boasted he had for the cubic equation that inspired Tartaglia himself to put forth his utmost effort and to discover a method for its solution that has, ever since its publication, been known as Cardan's Solution. In the contest with Floridas Tartaglia was complete victor, solving the thirty proposed cubic equations in two hours by using the general form of a reduced cubic, while Floridas solved none of the thirty.

Tartaglia, like most mathematicians of that age and a few succeeding ages, was the unhappy victim of a custom that permitted a mathematical discoverer to use his discovery to exalt himself instead of using it to advance the science or to serve society. Had Tartaglia been less a prey to such selfish practice his own name, not that of the unscrupulous Cardan, would have been immortally and rightfully associated with this famous and epoch-marking solution of the cubic Cardan persuaded Tartaglia to disclose his Method, promising sacredly to keep it secret. But basely false to his promise he published it later in his Ars Magna. The deception practiced illustrates a truth many times verified in mathematical history, namely: The destructive consequences of a mathematical error or untruth, repeatedly impressed upon the mind of the mathematical student throughout a sufficiently long time period, must ultimately insure honest thinking, but does not insure an honest CHARACTER. Other mathematicians than Cardan have been dishonest in their HUMAN relations. —*S. T. S.*

An Approach to a Class in Freshman Mathematics

By Rev. John A. Theobald
Columbia College, Dubuque, Iowa

The average student coming to college has more or less of an apathy for mathematics. This attitude seems to be an outgrowth of his experiences with the subject in his high school days. He dislikes mathematics because he has found the subject difficult, or because he has found so little of interest in it.

Upon asking students why they elected the course in mathematics they usually reply that they were advised to do so, or that they felt they needed it as a preparation for the profession they expect to enter. Some few choose mathematics for financial reasons, as this course does not entail laboratory fees. It is a rare occurrence to have a student admit he elected mathematics because he likes the subject.

Before making the approach to a class in freshman mathematics, it is well to have a clear picture of the student with whom you have to work.

I have learned from experience that it is unwise to expect too much of a mathematical background from the general run of freshmen. It is quite safe to assume that they are familiar with the fundamenatl operations of arithmetic. Then too, they know that algebra uses literal symbols together with arithmetical numbers. Again, most of them have some general knowledge of the theorems bearing on parallel lines and on similar triangles. To assume a more extensive background would eliminate at least some of the young college entrants.

I have further found that a number of beginners have a definite horror for fractions, both algebraic and arithmetical. Likewise, many do not suspect that a decimal is really a fraction, and these often hesitate, particularly in dividing, when decimals enter into the operation. I have found further, that most young students generally seem to regard the following: namely, negative exponents, fractional exponents, radical expressions and rattle snakes with equal dread.

In addition to these fear complexes, one generally finds certain weaknesses in the mathematical equipment, with which young students enter college. Some of these are as follows: There is a marked hesitancy when adding terms with literal coefficients. Some even fumble when the operation demands multiplication and division of polynomials. Factor-

ing, generally, is approached with caution, and in many cases produces an uneasiness similar to digging up embarrassing incidents, from a dark past, which they would rather forget than remember. The quadratic equation usually produces a startling surprise, and for the general run of students the previous experience with this troublesome contrivance has gone the way of oblivion, according to the happy rule by which youth succeeds to rid itself of its troubles.

Added to these disadvantages, there are certain handicaps with which ever so many students enter college mathematics. The principal ones are the mechanical type and the jumble type. The first includes students who have the habit of working mathematics according to a set of rules; the second those who are unable to interpret an algebraic expression as a composite, which represents a unique quantitative value. The mechanical type regards the operations of mathematics as a sort of empirical theory, whose underlying reasons, they believe, are not yet fully understood by anyone. The jumble type, on the other hand, regards an algebraic expression as a strange and meaningless array of letters and numbers, in which they see no relation to number and quantity as these occur in real life and experience.

In sizing up the background of the young college student, I do not mean to cast reflection on the schools he attended before entering college. In our own college classes we find it difficult to get mathematical training across, and many a quiz has shown that our best efforts in teaching so frequently fall short of satisfying results. For my part I am no longer surprised to find a second year student rusty on trigonometric identities, or even unaware that there are five standard forms of the equation of a straight line. I feel the difficulty lies in the fact that mathematics simply does not register definitely upon a single exposure.

Upon meeting a new class of freshmen, I approach the subject by trying to remove, or at least to lessen, the terror for mathematics. We adopt a motto, and the most suitable one I know is the terse and pertinent statement popularized by Sylvanus Thompson: "What one fool can do another can." I then assure them that I can work every example in the text. They usually get the drift.

Next, I pledge myself to a two-fold objective. I propose to do two rather surprising things. I guarantee that I will show them that mathematics is easy, and that mathematics is interesting. During the entire course I try to keep this contract in mind. I try to show that mathematics is easy by continually insisting that each step, in a mathematical procedure, involves only one single simple operation. In addition, I point out

day after day that in the solution of the problem at hand we follow a common sense procedure, and that a wrong step must likewise be a foolish and senseless step. Arithmetical analogies usually succeed admirably in showing the real simplicity of common sense mathematical procedure. To carry out the second part of my contract, namely to show that mathematics is interesting, I lose no opportunity to point out the following facts: First, I stress the marvelous consistency of mathematics. No matter what course of attack we follow, unless we blunder stupidly, the results reached, in any problem at hand, will always be the same. Mathematics never blunders, it never slips up on any detail, it never contradicts itself. Secondly, I insist that mathematics is generous. It sees all, knows all and tells all. Every conclusion reached reveals relations in addition to those that were sought; and if we are sufficiently alert, each result obtained gives us a story complete in every detail. The answer to any problem tells the whole truth and nothing but the truth. Thirdly, I show that mathematics is practical. I point out, wherever possible, how the topic under consideration can be applied in actual situations. I try to bring up type problems that could not be solved if the particular topic at hand were not brought into play. Fourthly, I lose no opportunity to point out the beautiful logic in mathematics. We begin with a few principles, and upon this foundation we erect an imposing structure of thought. Every detail, entering into this structure, is important to the structure as a whole. I try to point out how the principles developed today will be used in subsequent chapters, and when we reach those chapters we turn back again to take a second look at the principles upon which our new conclusions depend.

After having stated my aim, to show that mathematics is both easy and interesting, I make it clear what I expect from the class. I tell them frankly that the only way that mathematics can be learned is by doing the class assignment every day. To encourage this I demand a written exercise every day. These exercises, I assure them, are not penalties, but merely an evidence of their effort in cooperating with me to get the subject across. Furthermore, I tell the class that I will keep an accurate record of their daily written work, and that the written work will be considered in giving the grade for the course. Passing or failing the course will depend, to a great extent, on the daily written work.

The requirement of written work is so rigid that only sudden death can excuse a student from handing in the written exercise. However, our dealing must be reasonable. To be fair I allow any student, at any time, to defer the handing in of his written work to the Monday follow-

ing the day when the task was due. If for any reason a student needs extra time, beyond this concession, he must make arrangements with me.

Another understanding we have is that a student will never be annoyed by being reminded that he is delinquent in his daily work. It is his responsibility to see that his work is in, and unsatisfactory compliance with the "daily work rule" will mean an unsatisfactory grade. This last point I make so clear that they cannot misunderstand me nor doubt my word in the matter.

With these preliminaries finished, we are ready for the year's work. I try to do my part, and hope the students will do their part. I try to keep in mind that when a student fails, at least fifty per cent of the blame should ordinarily be chalked against the instructor. A perfect instructor would have no failures in his class, no matter what the subject might be.

This is, in short, my approach to a class in freshman mathematics. I try to determine the attitude and aptitude of the students coming to me. Then I make clear to them my part in the program, and lastly, I tell them the part they are expected to play, and how they are to play it.

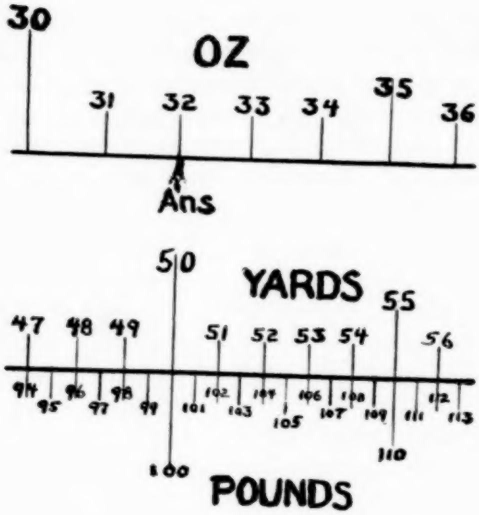
A Slide Rule Solution of a Woolen Mill Problem

By Edmund E. Ingalls
Albion College

A problem of frequent occurrence in woolen mills is that of finding the weight in ounces per yard of a roll of cloth. After a roll of cloth has been woven, the yardage and the weight is determined. Then using arithmetic, the pounds are multiplied by sixteen, and this product is divided by the number of yards in the roll, giving the result in ounces per yard. When the number of pounds and yards are not whole numbers, the example takes some time to work, and also offers chances for arithmetical mistakes. The author was asked if there was an "easier" method of obtaining the result without the arithmetical computation each time. The method should take less time, and if possible eliminate arithmetical mistakes.

Tables giving the results for the varying weights and yards had been tried without any enthusiastic response. A nomographic chart large enough to be easily read was then designed. This method of solution

was, however, discarded for that of a special slide rule, whose description follows:



This rule has two outer scales, and between them, a slide carrying a third scale, also an arrow to indicate the answer. Figure one shows a small portion of the rule. The three scales are logarithmic, as on the usual slide rule, instead of uniform, as on the foot rule. Consequently, each value was laid off at a distance proportional to the logarithm of this value. This graduation was marked with the value rather than the actual distance laid off. The limits of the several scales were suggested by the mill superintendent, Mr. C. Littlefield. To illustrate the working of a problem, let us assume that a roll of cloth weighs one hundred pounds and is fifty yards in length. Using the two lower scales, marked yards and pounds, the graduation marked fifty on the *yards* scale is brought over the graduation marked one hundred on the *pounds* scale. Then above the arrow, marked *Ans.*, the result of thirty-two is read on the scale marked *Oz.*, or the upper scale.

This rule has been used in preference to calculation using arithmetic by operatives who have had but little formal education. And this was after only a very short time practicing with the rule. In one case, two examples were worked with the operative, and then he went to work using the rule for fractional values of yards and pounds. This came as a rather pleasant surprise to the author, who has taught the use of the

ordinary slide rule to college classes over a period of years. The average student is uncertain and gains ability but slowly when working problems that involve fractional parts of the smallest division on the ordinary slide rule. In the opinion of the author this rapid learning of the manipulation of the special slide rule is due mainly to three factors. First, the rule is designed to solve but one relatively simple problem, and the answer is found in a certain place after the use of two labeled scales. Second, integral values are in general marked and the smallest subdivision has the same value, unity, on all the scales. Third, the operatives spend considerable time weighing cloth, and consequently have developed the ability to read a scale which is uniform, but, otherwise, similar to those on the rule.

It might be stated that the operatives would not use a slide rule of the usual type, but that this one adapted to their needs by eliminating certain drawbacks (from their point of view) was quickly accepted.

The author believes that this is only one of many situations where the use of the ordinary slide rule would not be considered in solving a particular problem of frequent occurrence, but where a specially designed slide rule adapted to the requirements would be readily used.

The Expanding Universe

By J. J. Nassau
Director Warner and Swasey Observatory
Cleveland, Ohio

One may summarize our knowledge of the expanding universe by answering the following questions: (a) What is it that expands? (b) What are the observational evidences of the expansion? (c) What is the rate of expansion? (d) What are the theories regarding it?

(a) The star system forming our galaxy, relatively speaking, being a compact group does not partake in the expansion, that is, the stars in it are held together by the law of gravitation. The expansion takes place between the billions of galaxies.

(b) As we observe these galaxies they seem to be receding from our galaxy. This becomes apparent from the shift of their spectral lines, known as the Doppler effect. In the absence of any satisfactory alternative, we are justified in explaining this shift to the red, as a velocity of recession.

(c) To determine the rate of recession it is necessary to ascertain the distances of these extra galactic objects. For the eight nearest to us, we utilize the Cepheid variables which yield a relatively high degree of accuracy. For the 76 other objects whose distances have been determined, some assumptions have been made which are bound to produce uncertain determinations. Thus, having the distance and the observed red shift, a linear relation has been established giving for the rate of recession 590 km. per second per 3,260,000 light years.

(d) In 1917, Professor Einstein modified the law of gravitation, $G_{uv} = 0$, to $G_{uv} = \lambda g_{uv}$ in order to avoid the difficulties of the boundary solution at infinity. This new equation makes the world static, finite, and saturated with mass. Another solution of the same equation was put forward in the same year by Professor deSitter which makes the world expanding but without mass. In 1923, Professor Eddington and Professor Weyl established independently the fact that the introduction of λ was necessary and that it is a factor that makes measurements of length relative. Assuming a non-static world Professor LeMaitre brought forward in 1928 a solution of the same equation which makes the world expanding, but this time with mass of uniform distribution.

In 1931, Eddington bridged this with the quantum theory and by utilizing the idea that distances within atoms must be functions of λ to produce relative measures, established the equation $\frac{\sqrt{N}}{R} = \frac{mc^2}{e^2}$ where N = number of electrons in the universe, R = initial radius of the universe, c = velocity of light, M and e mass and charge of an electron. That is, from laboratory values only he is able to determine a relation between N and R, from which the value of the rate of recession could be established.

A joint paper by Einstein and deSitter in 1932 brings out the fact that the factor λ may be equal to zero and we may still be able to explain the recession of the galaxies. The latest contribution (1933) on the theoretical side of this problem is the work of Professor Tolman who introduces a pulsating universe.

A picturization of the expanding universe may be made possible by the usual analogy of one less dimension. We can easily imagine the two dimensional surface of a sphere on which we have more or less equally spaced isolated two dimensional masses (galaxies). The sphere is embedded of course in the three dimensional space and an

increase in the radius of the sphere causes an increase in the distance between the masses, that is: if we choose any one of these masses as our position of observation the rest will appear to move away from us.

The space in which we have some 100,000,000,000 galaxies in our universe is a three dimensional surface embedded in a four dimensional spacetime. By the observed expansion of the universe we mean the expansion of this surface and from our analogy the observed recession of the galaxies is not a unique phenomenon, but a phenomenon observable from any galaxy.

The two forces that play important roles in this highly fascinating theory are Newton's "gravitational attraction" which is usually associated with the universal constant of gravitation G and the property of expansion which as we have seen is associated with the Greek letter λ.

If we are to trust recent speculations, some 5,000,000,000 years ago G had the upper hand and kept the mass of the universe intact and for some causes not yet quite clear λ had its turn and started the amazing expansion as a force against gravitation.

The story of the Greek letter λ and its struggle against G is admirably related in Eddington's new book "The Expanding Universe."

Parametric Solutions of Certain Diophantine Equations

By Ronald B. Thompson, Supt.
Beaver Crossing, Nebraska

The purpose of this paper is to present solutions of certain diophantine equations. The method used in obtaining these solutions is dependent upon equations involving the determinants of certain matrices. These matrices must be of such nature that they repeat their forms under matrix multiplication and addition.

We obtain explicit solutions in terms of independent parameters and when integers are assigned to these parameters we obtain multiple infinitudes of solutions of the problems under consideration. We do not however necessarily obtain all integral solutions by this method.

Especial attention is called to the solution of the equation

$$X_1^2+X_2^2+\;.\;.\;.\;.\;.\;+X_p^2=W^n,$$

p and n being arbitrary integers. It is thought by the author that this general equation has not been hitherto solved in parameters.

We also obtain the solution of the very general equation

$$X_1^2+a_1X_2^2+\ .\ .\ .\ .\ .\ +a_{n-1}X_n^2=Y_1^2+b_1Y_2^2+\ .\ .\ .\ .\ .\ +b_{m-1}Y^2_m,$$

n and m being arbitrary integers.

The solution of the equation

$$X_1^2+X_2^2+\ .\ .\ .\ .\ +X_p^2=W^n$$

is first given.

The solution of this equation may be written in a general form as follows:

$$X_1=x_1^n-{}_nC_2x_1^{n-2}\delta+{}_nC_4x_1^{n-4}\delta^2-{}_nC_6x_1^{n-6}\delta^3+{}_nC_8x_1^{n-8}\delta^4-\ .\ .\ .\ .\ .$$

$$X_2=x_2(-{}_nC_1x_1^{n-1}+{}_nC_3x_1^{n-3}\delta-{}_nC_5x_1^{n-5}\delta^2+{}_nC_7x_1^{n-7}\delta^3-\ .\ .\ .\ .\ .)$$

$$X_3=x_3(-{}_nC_1x_1^{n-1}+{}_nC_3x_1^{n-3}\delta-{}_nC_5x_1^{n-5}\delta^2+{}_nC_7x_1^{n-7}\delta^3-\ .\ .\ .\ .\ .)$$

. . . .

$$X_p=x_p(-{}_nC_1x_1^{n-1}+{}_nC_3x_1^{n-3}\delta-{}_nC_5x_1^{n-5}\delta^2+{}_nC_7x_1^{n-7}\delta^3-\ .\ .\ .\ .\ .)$$

$$W\ =x_1^2+\delta.$$

Where $\delta=x_2^2+x_3^2+x_4^2+\ .\ .\ .\ +x_p^2$ and where the last term in X_1 is $\pm\delta^{\frac{n}{2}}$ or $\pm{}_nC_1x_1\delta^{\frac{n-1}{2}}$ as n is even or odd and where the last term in X_i, $(i=2,3,\ .\ .\ .\ ,p)$, is $\pm{}_nC_1x_1x_i\delta^{\frac{n-2}{2}}$ or $\pm x_i\delta^{\frac{n-1}{2}}$ according as n is even or odd.

As an example let us write the solution of

$$X^2+Y^2+Z^2=W^7$$

$$X=m^7-21m^5(y^2+z^2)+35m^3(y^2+z^2)^2-7m\ (y^2+z^2)^3$$

$$Y=-7m^6y+35m^4y(y^2+z^2)-21m^2y(y^2+z^2)^2+y(y^2+z^2)^3$$

$$Z=-7m^6z+35m^4z(y^2+z^2)-21m^2z(y^2+z^2)^2+z(y^2+z^2)^3$$

$$W=m^2+y^2+z^2.$$

Setting $m=1$, $y=2$, $z=1$, we obtain

$$(-104)^2+(-464)^2+(-232)^2=6^7,$$

as one of the triple infinitude of solutions.

The solution of the equation

$$X_1^2+a_1X_2^2+\ .\ .\ .\ .\ .\ +a_{n-1}X_n^2=Y_1^2+b_1Y_2^2+\ .\ .\ .\ .\ .\ +b_{m-1}Y_m^2$$

is next given.

$X_1=h^2-a_1x_2^2-a_2x_3^2\ .\ .\ .\ -a_{n-1}x_n^2+b_1y_2^2+b_2y_3^2+\ .\ .\ .\ +b_{m-1}y_m^2$

$X_2=2hx_2$

$X_3=2hx_3$

. . . .

$X_n=2hx_n$

$Y_1=h^2-b_1y_2^2-b_2y_3^2-\ .\ .\ .\ b_{m-1}y_m^2+a_1x_2^2+a_2x_3^2+\ .\ .\ .\ +a_{n-1}x_n^2$

$Y_2=2hy_2$

$Y_3=2hy_3$

. . . .

$Y_m=2hy_m$

For example let us write the solution of the problem

$$X^2+5Y^2+6Z^2=T^2+4U^2+2V^2+3W^2.$$

$X=h^2-5y^2-6z^2+4u^2+2v^2+3w^2$

$Y=2hy$

$Z=2hz$

$T=h^2-4u^2-2v^2-3w^2+5y^2+6z^2$

$U=2hu$

$V=2hv$

$W=2hw$

Let $h=1,\ y=3,\ z=2,\ u=1,\ v=2,\ w=1.$

We then obtain

$$X^2+5Y^2+6Z^2=T^2+4U^2+2V^2+3W^2$$

$$2809+5\ .\ 36+6\ .\ 16=3025+4\ .\ 4+2\ .\ 16+3\ .\ 4$$

$$3085=3085.$$

This gives one of the sixfold infinitude of solutions obtained by this method.

The Rectification of the Hyperbola

By HARRY GWINNER
University of Maryland

In the Mathematics News Letter, issue of April-May, 1931, Mr. George A. Garrett proposes

Find the length of the Hyperbola $X^2-Y^2=1$ from a vertex to a point (x_1,y_1).

The following is similar and is given in Granville-Smith-Longley's "Elements of the Differential and Integral Calculus," page 276, Ex. 9.........

To find the length of the arc $X^2-Y^2=9$ from $(3,0)$ to $(5,4)$.

Solution:—Length of arc is given either by

$$(1).\quad S = \int_3^5 \sqrt{1+\frac{x^2}{y^2}}\,dx = \int_3^5 \sqrt{\frac{2x^2-9}{x^2-9}}\,dx;\ \text{or,}$$

$$(2).\quad S = \int_0^4 \sqrt{1+\frac{y^2}{x^2}}\,dy = \int_0^4 \sqrt{\frac{9+2y^2}{9+y^2}}\,dy.$$

These are both elliptic integrals; which cannot be evaluated in terms of the elementary functions. So use Simpson's rule as suggested in Problem No. 7, Page 275 of the above text. For this purpose the form (1) above cannot be used because the integrand becomes infinite when $x=3$, due to the fact that the inclination of the curve at $(3,0)$ is 90°. Hence evaluate form (2) as shown below:

y	y^2	$9+y^2$	$9+2y^2$	$\dfrac{9+2y^2}{9+y^2}$	$\sqrt{\dfrac{9+2y^2}{9+y^2}}$	Simpson's Rule
0	0	9	9	1.000	1.000	=1.000
1	1	10	11	1.000	1.049	=4.196
2	4	13	17	1.3007	1.144	=2.288
3	9	18	27	1.500	1.225	=4.900
4	16	25	41	1.6400	1.281	=1.281
					Total	=13.665

$$\text{and } \frac{13.665}{3} = 4.555 \text{ Result.}$$

The result as gotten by elliptic integrals is 4.556. So far, so good. If Mr. Garrett desires the solution of his problem using elliptic integrals and has access to Pierce's, Baker's or Hancock's Table of Integrals and if the Editor will agree to publish the same, I will contribute a solution.

Book Review Department

Edited by
P. K. Smith

Plane Trigonometry, by C. A. Ewing. McGraw-Hill Book Company, New York, 1933.

This text is written evidently with much effort toward simplification. The text has been used by the author for several years with high school classes.

A short, but clear, discussion on computation with approximate numbers is given in Chapter I. The last part of this chapter is devoted to an ample discussion of logarithms and to the slide rule.

In Chapters II and III the functions of the acute angle and solutions of the right triangle are given. In Chapter IV the Law of Sines, the Law of Cosines, the Law of Tangents, and the formula for the tangent of the half angle are developed. A geometric proof is given for the Law of Tangents. Using the formulas in Chapter IV the author then develops the solutions of the oblique triangle in Chapter V. The first five chapters make up Part One and constitute an elementary course in trigonometry.

Chapter VI begins Part Two with the general definitions of the functions. Chapter VII takes up the addition formulas, half-angle and multiple angle formulas. In the next two chapters the trigonometric identities, trigonometric equations and the inverse functions are treated. The final chapters, X and XI, are devoted to the line values for the functions, to the graphs of the functions, to review exercises and to typical examinations. The text has no answers and no tables.

The arrangement of the material is fine with a view to leading the average student gradually through the course. The writer has found that the material of the first three chapters of Part Two when too early introduced is difficult for most students. This text is worthy of close examination with a view to its use in college as well as high school.

The typographical work is excellent, the dimensions are 6 by 8 inches, and there are 165 pages.

—P. K. SMITH.

New High School Arithmetic—Revised—By Webster Wells and Walter W. Hart. D. C. Heath & Co. 1933.

This book is divided into thirteen chapters. The first three chapters; integers, fractions, and decimal fractions cover one hundred and seven pages and provide a thorough treatment of this material for the purpose of establishing the student in these fundamental operations.

The chapter on denominate numbers covers twenty-five pages and includes facts and operations that should be a part of every one's equipment.

Just enough material is devoted to practical geometry, and the material has been well selected.

The chapter on percentage covers eighteen pages. Clear explanations of the operations are made, and many good problems for developing ability are included.

The last six chapters covering one hundred and twenty-five pages are devoted to commercial arithmetic and the field is adequately covered.

The books contains 352 pages 5 by 8 inches with good clear type and excellent figures.

—HENRY F. SHROEDER.

Problem Department

Edited by
T. A. BICKERSTAFF

This department aims to provide problems of varying degrees of difficulty which will interest anyone who is engaged in the study of mathematics.

All readers, whether subscribers or not, are invited to propose problems and to solve problems here proposed.

Problems and solutions will be credited to their authors.

Send all communications about problems to T. A. Bickerstaff, University, Mississippi.

PROBLEMS FOR SOLUTION

No. 47. Proposed by E. C. Kennedy, University of Texas.
Prove or disprove:

$$\text{Limit} \frac{\sqrt{0}+\sqrt{1}+\sqrt{2}+\sqrt{3}+\ldots\ldots+\sqrt{n}}{(n+1)\sqrt{n}} = \frac{2}{3}$$

No. 48: Proposed by William E. Byrne, Virginia Military Institute, Lexington, Virginia.

Given the function,

$$f(x)=(1+x)^{\frac{1}{x}}-e, \quad x\neq 0$$
$$f(0)=0$$

Find the Taylor expansion of f(x) valid for x near 0.

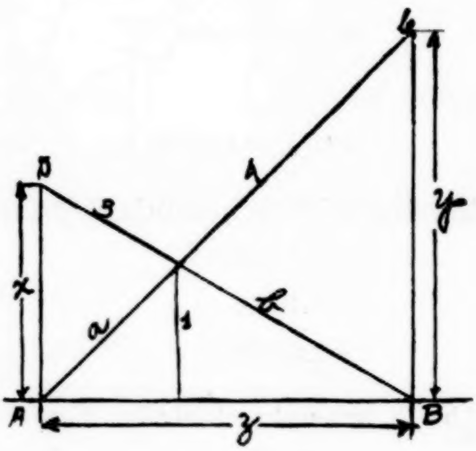
SOLUTIONS

No. 35. Proposed by Earl Thomas, Louisiana State University.

The ends of two ladders rest at the bottoms of parallel vertical walls on opposite sides of an alley and each leans against the wall on the opposite side of the alley. The first is 40 feet long, the second is 30 feet long, and they cross at a point 10 feet above the alley. How wide is the alley?

Solution by A. W. Randall, Prairie View State College, Prairie View, Texas. Also solved by H. M. Zerbe, Wilkesbarre, Pa., and James A. Ward, L. S. U.

Solution: Divide the dimensions 40, 30, and 10 by 10, in order to work with smaller numbers.



From similar triangles

$$a : (4-a) = (3-b) : b,$$

Clearing

$$3a+4b=12 \dots\dots\dots\dots (1)$$

Similarly

$$x : 1 = 3 : b$$

$$x = 3/b \dots\dots\dots\dots (2)$$

Secondly

$$y : 1 = 4 : a$$

$$y = 4/a \dots\dots\dots\dots (3)$$

From the right triangles, ABC and ABD, we have

$$4^2 - y^2 = z^2, \dots\dots\dots\dots(4)$$

$$3^2 - x^2 = z^2. \dots\dots\dots\dots(5)$$

Equating and clearing (4) and (5), we get

$$y^2 - x^2 = 7. \dots\dots\dots\dots(6)$$

Substituting (2) and (3) in (6), we obtain

$$16/a^2 - 9/b^2 = 7. \dots\dots\dots(7)$$

But from (1) $\quad a = 4(3-b)/3. \dots\dots\dots(8)$

Substituting (8) in (7), we have

$$9/(3-b)^2 - 9/b^2 = 7.$$

Clearing and reducing, we find

$$7b^4 - 42b^3 + 63b^2 - 54b + 81 = 0. \dots\dots(9)$$

Solving (9) for the value, which appropriately fits our problem, we find

$$b = 2.01215$$

$$x = 1.49094$$

$$z = 2.60329$$

Since we divided by 10, we must multiply by 10, getting

$$z = 26.0329 \text{ feet.}$$

Therefore the alley is 26.0329 feet wide.

No. 41. Proposed by T. A. Bickerstaff, University of Mississippi.

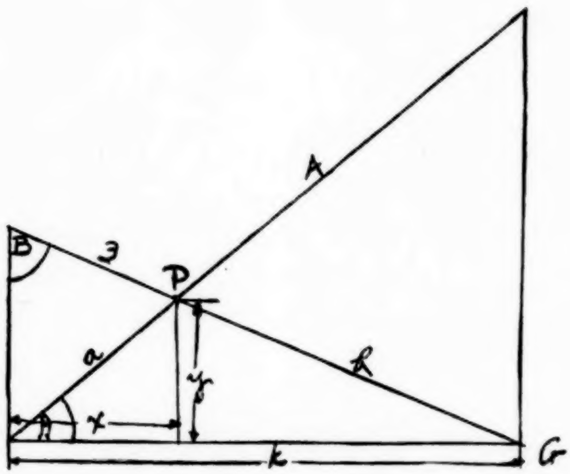
In problem No. 35, find the locus of the crossing point as the width of the alley is made to vary from 0 to 30 feet.

Solved by A. W. Randall, Prairie View, Texas.

Solution: Divide the dimensions 40, 30, and 10 by 10, in order to work with smaller numbers.

Let AP = a,

GP = b.



From trigonometry,

$$x = (3 - b) \sin B, \quad \dots \dots \dots \dots (1)$$

$$y = b \cos B. \quad \dots \dots \dots \dots (2)$$

Eliminating *b* between (1) and (2), we find

$$y/\cos B = (3 \sin B - x)/\sin B, \text{ or}$$

$$x/\sin B + y/\cos B = 3. \quad \dots \dots \dots \dots (3)$$

Again,

$$x = k - (4 - a)\cos A, \quad \dots \dots \dots \dots (4)$$

$$y = a \sin A. \quad \dots \dots \dots \dots (5)$$

Eliminating *a* between (4) and (5), we get

$$(x + 4 \cos A - k)/\cos A = y/\sin A, \text{ or}$$

$$y/\sin A - x/\cos A = 4 - k/\cos A. \quad \dots (6)$$

From the figure $\text{Sin } B = k/3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$

$$\text{Cos } B = \sqrt{(9-k^2)}/3 \ldots\ldots\ldots\ldots (8)$$

$$\text{Cos } A = k/4 \ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

$$\text{Sin } A = \sqrt{(16-k^2)} \ldots\ldots\ldots\ldots (10)$$

Substituting (7) and (8) in (3), we obtain

$$x/k + y/\sqrt{(9-k^2)} = 1 \ldots\ldots\ldots\ldots (11)$$

Substituting (9) and (10) in (6) and reducing, we find

$$y/\sqrt{(16-k^2)} - x/k = 0 \ldots\ldots\ldots\ldots (12)$$

Eliminating *k*, between (11) and (12), we obtain

$$1 - \sqrt{(x^2+y^2)}/2 + (x^2+y^2)/16 = y^2(x^2+y^2)/(9y^2-7x^2).$$

Clearing and reducing, we have

$$49x^8 + 49y^8 + 294x^4y^4 + 196x^6y^2 + 196y^6x^2 + 20736y^4 + 12544x^4$$

$$+ 6048x^4y^2 + 416x^2y^4 - 7200y^6 - 1568x^6 - 32256x^4y^2 = 0 \ldots (13)$$

NOTE: The curve represented by the above equation is 1/10 of its natural size, since we divided our dimensions by 10 in the beginning, in order to work with smaller numbers. The above curve (13) is closed, and passes through the origin. It resembles a lemniscate.

Scripta Mathematica

A QUARTERLY JOURNAL

Devoted to the Philosophy, History and Expository Treatment of Mathematics

— — —

Edited by Jekuthiel Ginsburg with the cooperation of Raymond Clare Archibald, Louis Charles Karpinski, Cassius Jackson Keyser, Gino Loria, Vera Sanford, Lao Genevra Simons, David Eugene Smith, Sir Thomas Little Heath, Adolf Frankel, Joseph J. Schwartz.

— — —

A Subscription is $3.00 per Year

A Single Copy is $1.00

— — —

Correspondence should be addressed to:

SCRIPTA MATHEMATICA

Amsterdam Ave. and 186th St.

New York, N. Y.

RATS IN THEIR HAIR

lozenges in their reticules, blue stockings on their limbs—really the women of the smelling salts didn't have a leg to stand on.

Consider, by comparison, the women of today. Bright, alert, viewing the world far enough above the horizon to escape obscuring mists. Higher institutions of learning have helped women to comb the rats out of their hair, the cobwebs out of their thinking. The Louisiana State University holds an important part in this helpful program. Beginning with one co-ed in 1904, it now offers instruction to almost 2,000 women. Many of them hold important elective positions on the campus, among them being the presidency of the Mathematics Graduate Club.

Louisiana State University

Baton Rouge